

[illegible]

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--Recently, as the size of a magnetic disk apparatus has been reduced and the storage capacity thereof has been enlarged, the recording density of a recording medium has become high, and thus a magnetic head which floats low over the disk (small clearance) is required. However, because of the requirement that the magnetic head be resistant to shock, there is also a need to reduce occurrences of contact between the magnetic head and the disk.--

Please replace the paragraph beginning on page 5, line 2, with the following rewritten paragraph:

--A more specific object of the present invention is to provide a MR head that has an improved structure which makes it possible for a fine projection on the magnetic disk to hit the MR head without causing an abnormal reproduction signal.--

Please replace the paragraph beginning on page 28, line 35, with the following rewritten paragraph:

--The amount  $h$  of the floating of the MR head is as small as 30-50 nm due to an increase in the recording density. As shown by a two-dot chained line shown in Fig. 22B, the fine projection 121 may hit the end surface 112a of the film structure part 112. Further, if a magnitude  $Nh$  of a deformed convex portion expansion of the film structure part 112 due

to the thermal asperity is approximately equal to 5 nm, the fine projection 121 may more frequently hit the end surface 112a of the film structure part 112. The magnitude Nh of the expansion of the film structure part will be described in detail later with reference to Fig. 28B.--

Please replace the paragraph beginning on page 29, line 32, with the following rewritten paragraph:

--Hence, the fifth through the ninth embodiments of the present invention are to provide an MR head and a magnetic disk apparatus equipped with the same in which the MR head has an improved structure which makes it possible for a fine projection on the magnetic disk to hit the MR head without causing an abnormal reproduction signal.--

IN THE CLAIMS:

Please cancel claims 1-18 without prejudice, and enter the following new claims 19-26 as follows:

- 1                    19.    (New)        A magnetic head comprising:
- 2                    a slider having a rail with a top surface;
- 3                    a thin-film element part for writing and reading information formed on an end
- 4                    of said rail top surface of said slider; and

5 a protective film formed on said thin-film element part and defining a distal  
6 end of the rail whereby air exits said slider at said distal end, said protective film having an  
7 end surface between at least two recesses, said thin-film element being positioned outside  
8 and between said recesses and on said end surface, said recesses being formed within a width  
9 of said rail and extending to said distal end defined by said protective film.

1 20. (New) A magnetic head, comprising:  
2 a slider with a flying surface;  
3 a thin-film element for writing and reading information formed on an end of  
4 said slider; and  
5 a protective film formed on said thin-film element and defining a distal end  
6 where air exits said slider, said protective film having a side surface generally perpendicular  
7 to said flying surface with a recess extending from an area near said thin-film element to said  
8 distal end of said protective film.

1 21. (New) The magnetic head as claimed in claim 20, wherein said  
2 recess has a cross section of a step or a letter V.

1                   22.   (New)       A magnetic disk apparatus comprising:  
2                   a head supporting part for carrying a magnetic head claimed in claim 19, for  
3 writing and reading information to enable said head to float over a recording medium;  
4                   an arm part on which said head supporting part is fitted; and  
5                   a driving part for moving said arm part over said recording medium.

1                   23.   (New)       The magnetic head as claimed in claim 20, wherein said  
2 thin-film element is constructed of a combination of an electromagnetic induction element  
3 and a magnetoresistant element.

1                   24.   (New)       The magnetic head as claimed in claim 21, wherein said  
2 thin-film element is constructed of a combination of an electromagnetic induction element  
3 and a magnetoresistant element.

1                   25.   (New)       A magnetic disk apparatus comprising:  
2                   a head supporting part for carrying a magnetic head claimed in claim 20, for  
3 writing and reading information to enable said head to float over a recording medium;  
4                   an arm part on which said head supporting part is fitted; and  
5                   a driving part for moving said arm part over said recording medium.

1                   26.   (New)       A magnetic disk apparatus comprising:  
2                   a head supporting part for carrying a magnetic head claimed in claim 21, for  
3 writing and reading information to enable said head to float over a recording medium;  
4                   an arm part on which said head supporting part is fitted; and  
5                   a driving part for moving said arm part over said recording medium.

### **REMARKS**

Applicant has amended the specification to place it in better grammatical form.  
No new matter has been added by these amendments. Applicant has canceled claims 1-18 without prejudice, and added new claims 19-26. Applicant submits that claims 19-26 are in condition for allowance, which is respectfully requested. As a preliminary matter, with regard to the drawings, Applicant has included herewith 2 sheets of formal drawings and a Separate Transmittal of Formal Drawings as substitutes for the 2 of 32 sheets provided with the specification. Approval of the drawings is respectfully submitted.

Attached hereto is a marked-up version of the changes made to the specification and claims by the current amendment. The attached Appendix is captioned “**Version with markings to show changes made.**”

Applicant respectfully requests consideration and allowance of the claimed invention. The Examiner is invited to contact the undersigned attorney if an interview would expedite prosecution.

Respectfully submitted,

GREER, BURNS & CRAIN, LTD.

By



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July 3, 2001

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**VERSION WITH MARKINGS TO SHOW CHANGES MADE**

**IN THE SPECIFICATION:**

The paragraph beginning on page 2, line 15, has been amended as follows:

--Recently, as the [scale] size of a magnetic disk apparatus has been reduced and the storage capacity thereof has been enlarged, the recording density of a recording medium has become high, and thus a magnetic head which floats low over the disk (small clearance) is required. However, because of the requirement that the magnetic head be resistant to shock, there is also a need to reduce occurrences of contact between the magnetic head and the disk.--

The paragraph beginning on page 5, line 2, has been amended as follows:

--A more specific object of the present invention is to provide [an MR head and] a magnetic disk apparatus equipped with [the same in which the MR head] a MR head that has an improved structure which makes it possible for a fine projection on the magnetic disk to hit the MR head without causing an abnormal reproduction signal.--



The paragraph beginning on page 28, line 35, has been amended as follows:

--The amount h of the floating of the MR head is as small as 30-50 nm due to an increase in the recording density. As shown by a two-dot chained line shown in Fig. 22B, the fine projection 121 may hit the end surface 112a of the film structure part 112. Further, if a magnitude Nh of a deformed convex portion [(swelling)] expansion of the film structure part 112 due to the thermal asperity is approximately equal to 5 nm, the fine projection 121 may more frequently hit the end surface 112a of the film structure part 112. The magnitude Nh of the [swelling] expansion of the film structure part will be described in detail later with reference to Fig. 28B.--

The paragraph beginning on page 29, line 32, has been amended as follows:

--Hence, the fifth through the ninth embodiments of the present invention are to provide an MR head and a magnetic disk apparatus equipped with the same in which the MR head has an improved structure which makes it possible for a fine projection on the magnetic disk to hit the MR head without causing an abnormal reproduction signal.--

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PATENT APPLICATION  
IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re U.S. Patent Application

Applicant: Kanda et al.

Divisional of

Serial No.: 08/834,436


Divisional

Filing Date: July 3, 2001

For: MAGNETIC HEAD WITH IMPROVED  
FLOATING SURFACE

Art Unit: 2652

Examiner: Miller, B.

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)  
) I hereby certify that this paper is being deposited with  
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) EXPRESS WCM  
) Appr. February 20, 1998

**SUBMISSION OF FORMAL DRAWINGS**

Box Patent Application  
Assistant Commissioner for Patents  
Washington, D.C. 20231

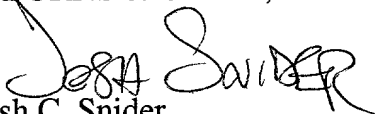
Dear Sir:

Transmitted herewith are two (2) sheets of formal drawings to be substituted  
for FIGs. 25A-25F and 28A-28B of the informal drawings submitted with the above-  
identified application for a patent.

Respectfully submitted,

GREER, BURNS & CRAIN, LTD.

By

  
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FIG. 25A

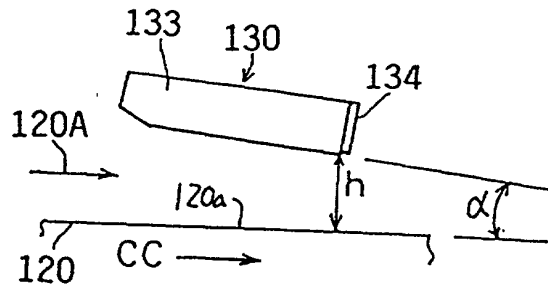


FIG. 25B

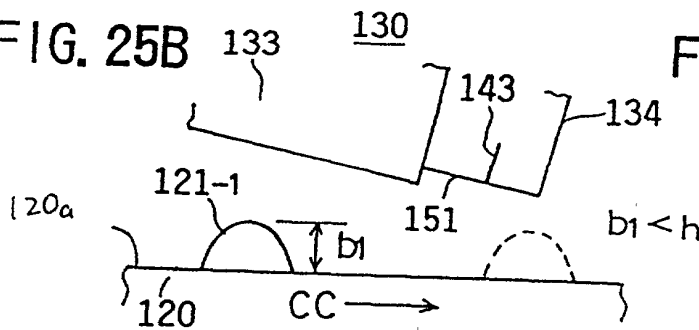


FIG. 25C

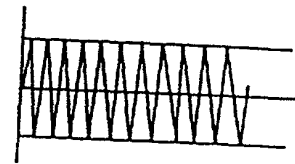


FIG. 25D

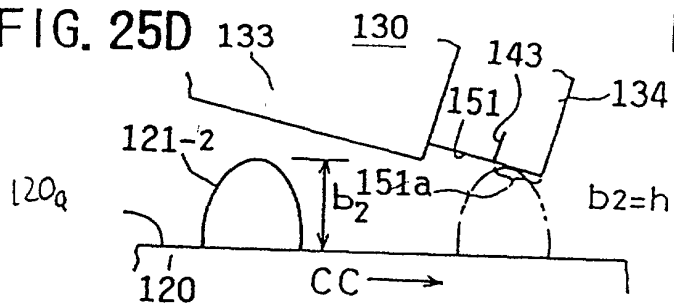


FIG. 25E

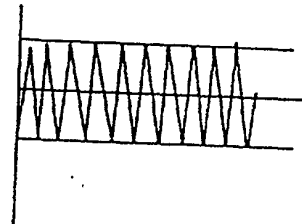


FIG. 25F

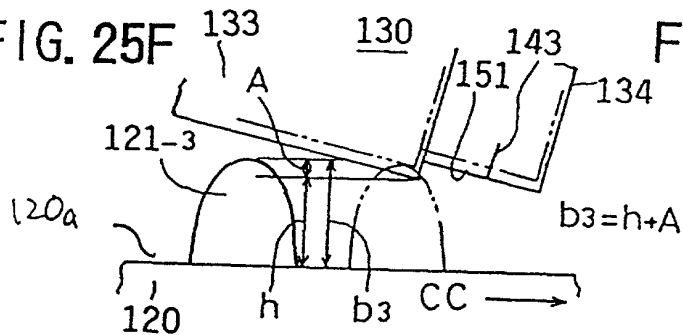


FIG. 25G

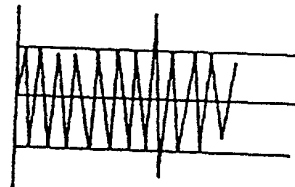


FIG. 25A

FIG. 28A

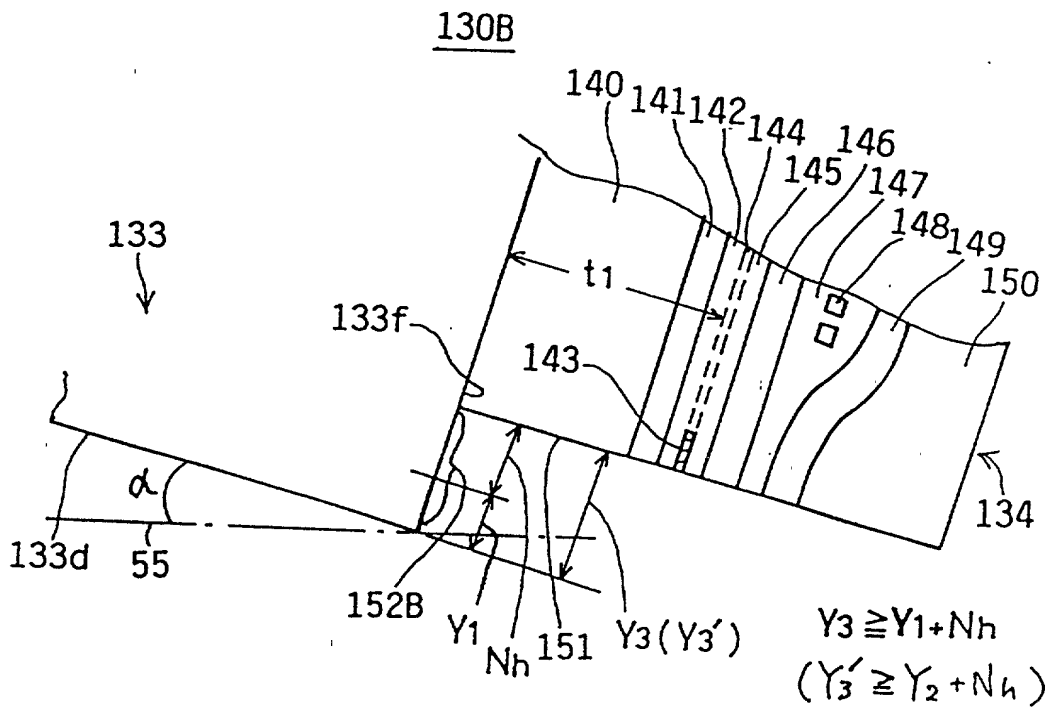


FIG. 28B

